

### Remarks

The specification and Claims 4, 6, 7, 8, 9, 10, 14 and 16 have been amended in accordance with the Examiner's suggestions. To the extent any of these amendments were made merely to correct typographical errors and/or improper claim form, Applicants respectfully reserve all rights under the Doctrine of Equivalents. Support for these amendments is found in the claims as originally filed and throughout the specification and more specifically at paragraphs 1, 10, 12, 19, 24 and 25 . No new matter has been added, and no new material presented that would necessitate an additional search on the part of the Examiner.

Upon entry of this Amendment and Response, Claims 1-16 remain pending.

### Objections

#### Drawings

The drawings were objected to under 37 C.F.R. §§1.83 and 1.84.

In response, Applicant submits herewith a Replacement Drawing Sheets in which Figures 1 and 2 have been labeled in accordance with the Examiner's suggestions.

#### Specification

The specification was objected to because according to the Examiner page 5, line 6 contains an illegible word.

In response, Applicants have amended the specification to clarify that the word is "defined".

Applicants thank the Examiner for reminding them of the typical language and form of a disclosure including information about subject headings. Applicants respectfully elect not to add the headings. Section headings are not statutorily required for filing a non-provisional patent application under 35 USC § 111(a), but are only guidelines that are suggested for applicants' use. (See 37 CFR § 1.51(d); "Miscellaneous Changes in Patent Practice, Response to comments 17 and 18" (Official Gazette, August 13, 1996) [Docket No: 950620162-6014-02] RIN 0651-AA75 ("Section 1.77 is permissive rather than mandatory. ... [T]he Office will not require any application to comply with the format set forth in 1.77")). (See also MPEP § 608.01(a)).

### Claims

Claims 1-16 were objected to because, according to the Examiner, the claim term “substantially all images” of Claims 1, 7 and 11 is unclear. Applicants respectfully traverse and submit that one of skill in the art would readily understand that “substantially all images” includes the total number of images as well as a number approximating the total number of images.

Claims 4 and 14 were objected to because, according to the Examiner, any acronyms should be spelled out.

In response, Applicants’ have amended Claims 4 and 14 in accordance with the Examiner’s suggestion.

Claims 6, 10 and 16 were objected to because, according to the Examiner, the claim term “substantially sphere-like organ” is unclear. Applicants respectfully traverse and submit that the claim term would be clear to one of ordinary skill in the relevant art. However, without conceding the correctness of the Examiner’s position, but in order to expedite prosecution of this application, Applicants have amended Claims 6, 10 and 16 in accordance with the Examiner’s suggestion.

Claim 6, 10 and 16 were also objected to because, according to the Examiner, the claim term “substantially correspond” is unclear. Applicants respectfully traverse and submit that one of skill in the art would readily understand that “substantially correspond” in this context means that the left and right parts of the flat plane image significantly match the inside and outside of the imaged organ.

In view of the above amendments and remarks, Applicants respectfully request withdrawal of these objections.

### Rejection Under 35 U.S.C. § 101

Claims 7-10 were rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter. According to the Examiner, the claims do not define a computer readable medium or memory and are thus non –statutory for that reason.

In response, Applicants have amended Claims 7-10 in accordance with the Examiner's suggestions. Accordingly, Applicants respectfully request withdrawal of this rejection.

Rejection Under 35 U.S.C. § 112, First Paragraph

Claimed 1-16 were rejected under 35 U.S.C. 112, first paragraph, as not reasonably providing enablement for the claim term "other body part."

Applicants respectfully traverse. One of ordinary skill in the relevant art would readily understand that "other body part" refers to any body part capable of being imaged by the disclosed means. Thus, the specification enables the skilled artisan to practice the invention commensurate in scope with the claims.

Accordingly, Applicants respectfully request withdrawal of this rejection.

Rejections Under 35 U.S.C. § 102(b)

Claims 1-3, 5, 7-9, 11-13, and 15 were rejected under 35 U.S.C. 102(b) as being anticipated by Malassiotis and Strintzis, Tracking the Left Ventricle in Echocardiographic Images by Learning Heart Dynamics (Malassiotis). For the following reasons, Applicant respectfully traverses.

A claim is anticipated under section 102 only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Manual of Patent Examining Procedure* § 2131 (8th ed., Rev. 4, Oct. 2005), citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q. 2d 1051, 1053 (Fed. Cir. 1987). Thus, the standard for rejection under 35 U.S.C. § 102 is identity.

Factual analysis below shows that is not the same as the subject matter of the Applicants' claimed invention.

Malassiotis discloses application of a temporal learning-filtering procedure to refine the left ventricle (LV) boundary detected by an active-contour model. A Hough transform technique is used to find an initial approximation of the object boundary at the first frame of a sequence of images. Then, an active-contour model is used in a coarse-to-fine framework for the estimation of a noisy LV boundary. Principal component analysis is then applied to form a reduced order

orthonormal basis of the LV deformations, based on a sequence of noisy boundary observations. This basis is then used to constrain the motion of the active contour identification, and results of epicardial boundary identification in B-mode images are presented.

Malassiotis does not disclose or contemplate Applicants' claimed apparatus and software which is capable of segmenting a series of 2D or 3D images of a subject's body part where a first segmented image is modified used for the subsequent segmentation of the remainder of images of an image series according transformation or sequence of transformations that fits the first image to any further image. Rather, Malassiotis discloses estimating and refining an LV boundary and then constraining the motion of the boundary.

Further, Malassiotis discloses only use of a Hough transform technique to find an initial approximation of the object boundary. In contrast, Applicants' invention allows for any type of segmentation to be applied initially as the first segmentation on the first image.

Moreover, Malassiotis discloses only echocardiogram images, while the initial image for Applicants' invention may be collected by virtually any monitoring means including but not necessarily limited to MR, CT, NM and US.

The legal standard for rejection under 35 U.S.C. §102 is identity. As shown above, Malassiotis is not the same as the subject matter of Applicants' invention as claimed, e.g. in Claims 1 and 7. Claims 2, 3, 5, 7-9, 11-13, and 15 all depend directly or indirectly from independent Claims 1 and 7 and incorporate the subject matter of these claims and contain additional subject matter. Thus, because Claims 1 or 7 are not anticipated by Malassiotis, Claims 2, 3, 5, 7-9, 11-13, and 15 also are not anticipated by this reference.

Accordingly, Applicants respectfully assert that Claims 1-3, 5, 7-9, 11-13, and 15 are novel in view of Malassiotis, and respectfully request withdrawal of the Examiner's rejection under 35 U.S.C. §102(b).

#### 35 U.S.C. § 103(a) Rejections

Claims 4 and 14 were rejected under 35 U.S.C. 103(a) as being obvious over Malassiotis in view of U.S. 5,381,791 (Qian). Applicants respectfully traverse.

According to a summary of criteria in the *Manual of Patent Examining Procedure*, "[t]o establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be

some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicants' disclosure." [emphasis added] *Manual of Patent Examining Procedure* §2142 (8th Ed. Rev.2, May 2, 2004); *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicants respectfully traverse the above rejection, and show that the facts of the case and the relevant case law indicate that the invention would not have been obvious to one of ordinary skill in the art at the time the application was filed because the underlying facts show that the criteria for a *prima facie* rejection have not been met. Applicants specifically note that Claims 4 and 14 depend either directly or indirectly from Claims 1 and 7 and, thus, include all of the limitations of these claims.

Applicants have shown above that Malassiotis does not teach or suggest the Applicants' claimed invention. Specifically, Malassiotis does not disclose or contemplate Applicants' claimed apparatus and software which is capable of segmenting a series of 2D or 3D images of a subject's body part where a first segmented image is modified used for the subsequent segmentation of the remainder of images of an image series according transformation or sequence of transformations that fits the first image to any further image. (see e.g., Claims 1 and 7). Malassiotis instead discloses estimating and refining an LV boundary and then constraining the motion of the boundary.

Further, Malassiotis discloses only use of a Hough transform technique to find an initial approximation of the object boundary. In contrast, Applicants' invention allows for any type of segmentation to be applied initially as the first segmentation on the first image.

Moreover, Malassiotis discloses only echocardiogram images, while the initial image for Applicants' invention may be collected by virtually any monitoring means including but not necessarily limited to MR, CT, NM and US.

Qian discloses methods for automatic identification of anatomical features of interest from a nuclear medicine (NM) image. Contrary to the Examiner's assertion, Qian does not teach

or otherwise suggest a Col. 1, lines 10-29 collecting images for use in Qian's method with MR, CT. In short, Qian does not remedy the deficiencies of Malassiotis.

Accordingly, by the legal criteria discussed above, and by the underlying facts of the content of the cited prior art and of the present pending claims, it is clear that the combination of Malassiotis and Qian fails to teach or suggest all the limitations of any of Claims 4 or 14 of Applicants' invention. Thus, a *prima facie* case has not been made that Applicants' invention is obvious.

Further, Qian does not teach or suggest modifying the method of Malassiotis to arrive at the apparatus and methods of Applicants present invention.

Therefore, a *prima facie* case that Claims 4 and 14 are obvious has not been made.

Accordingly, Applicants respectfully request withdrawal of rejection of Claims 3, 4 and 6 under 35 U.S.C. §103(a).

Claims 6, 10 and 16 were also rejected under 35 U.S.C. 103(a) as being obvious over Malassiotis in view of U.S. 5,435,310 (Sheehan). Applicants respectfully traverse.

Applicants have shown above that Malassiotis does not teach or suggest the Applicants' claimed invention (e.g. Claims 1 and 7). Applicants specifically note that Claims 6, 10 and 16 all depend either directly or indirectly from Claims 1 and 7 and, thus, include all of the limitations of these claims.

Sheehan discloses a method for imaging three-dimensional modeling portions of the heart using ultrasound imaging. Figures. 2B, 3 and 4 show respectively an image plane of the heart, a cross-sectional view of a portion of the heart imaged along its longitudinal axis, and a cross-sectional view of a portion of the heart imaged through the chambers of the heart. Contrary to the Examiner's assertion, these Figures do not necessarily show the walls of the heart in a flat plane wherein the left and right part of the plane substantially correspond to the inside and outside of the organ. In all of these Figures inside and outside portions of the heart are clearly represented on both the left and right parts of the plane (i.e. over the entire image).

Thus, by the legal criteria discussed above, and by the underlying facts of the content of the cited prior art and of the present pending claims, it is clear that the combination of Malassiotis and Sheehan fails to teach or suggest all the limitations of any of Claims 6, 10 or 16 of Applicants' invention. Additionally, Sheehan fails to cure any of the remedies of Malassiotis

with respect to the other claims discussed above. Thus, a *prima facie* case has not been made that Applicants' invention is obvious.

Further, Sheehan does not teach or suggest modifying the method of Malassiotis to arrive at the apparatus and methods of Applicants present invention.

Therefore, a *prima facie* case that Claims 6, 10 and 16 are obvious has not been made.

Accordingly, Applicants respectfully request withdrawal of rejection of Claims 6, 10 and 16 under 35 U.S.C. §103(a).

Summary

In view of the foregoing amendments and remarks, Applicant respectfully submits that the pending claims are in condition for allowance, which is respectfully requested.

If there are any questions regarding these remarks, the Examiner is invited and encouraged to contact Applicants' representative at the telephone number provided.

Respectfully submitted,

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